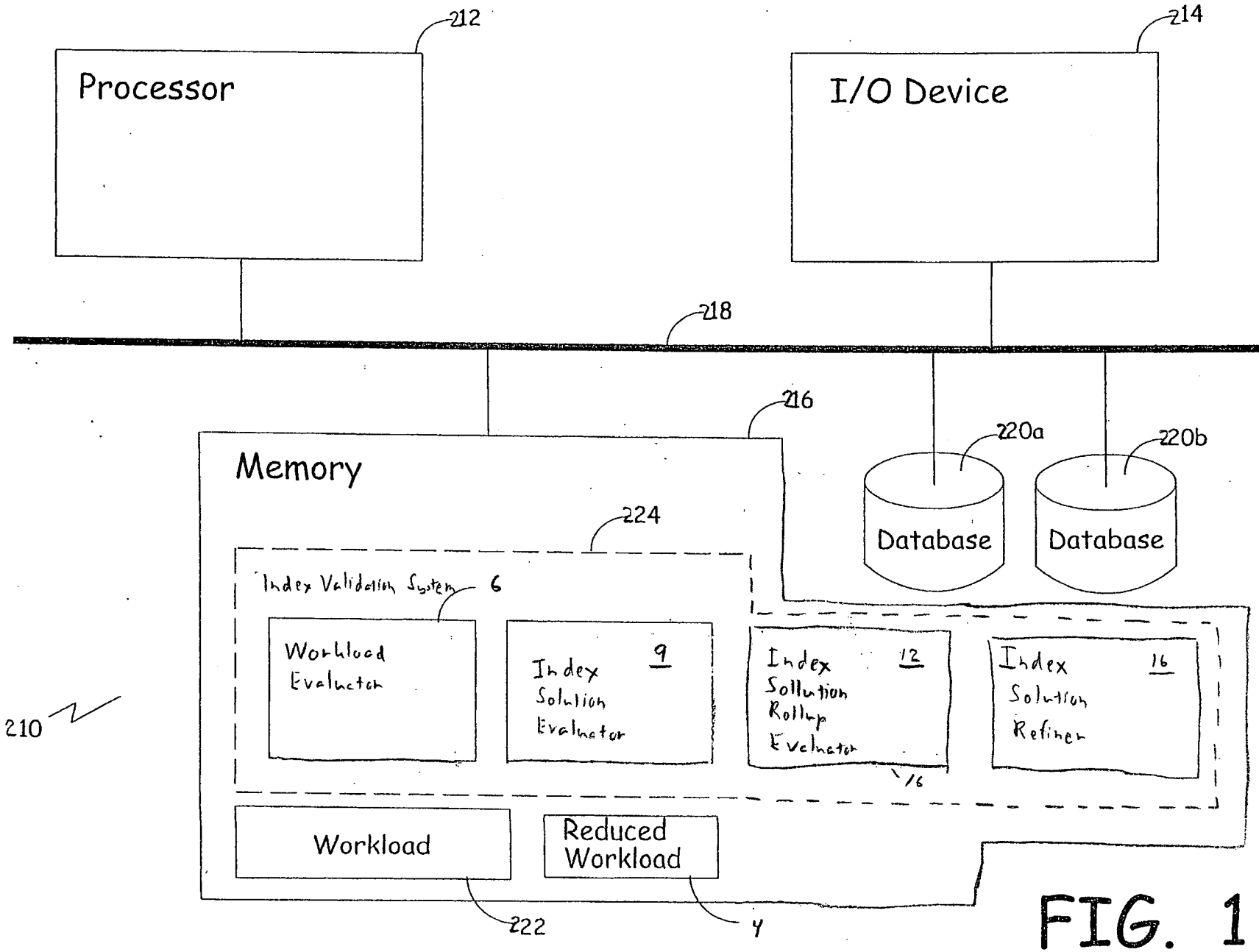
212
Processor
214
I/O Device
218
216
Memory
220a
220b
Database
Database
224
Index Validation System 6
Workload Evaluator
Index Solution Evaluator 9
Index Solution Rollup Evaluator 12
Index Solution Refiner 16
16
210
Workload
Reduced Workload
222
4

FIG. 1

DOCKET: 60650.50

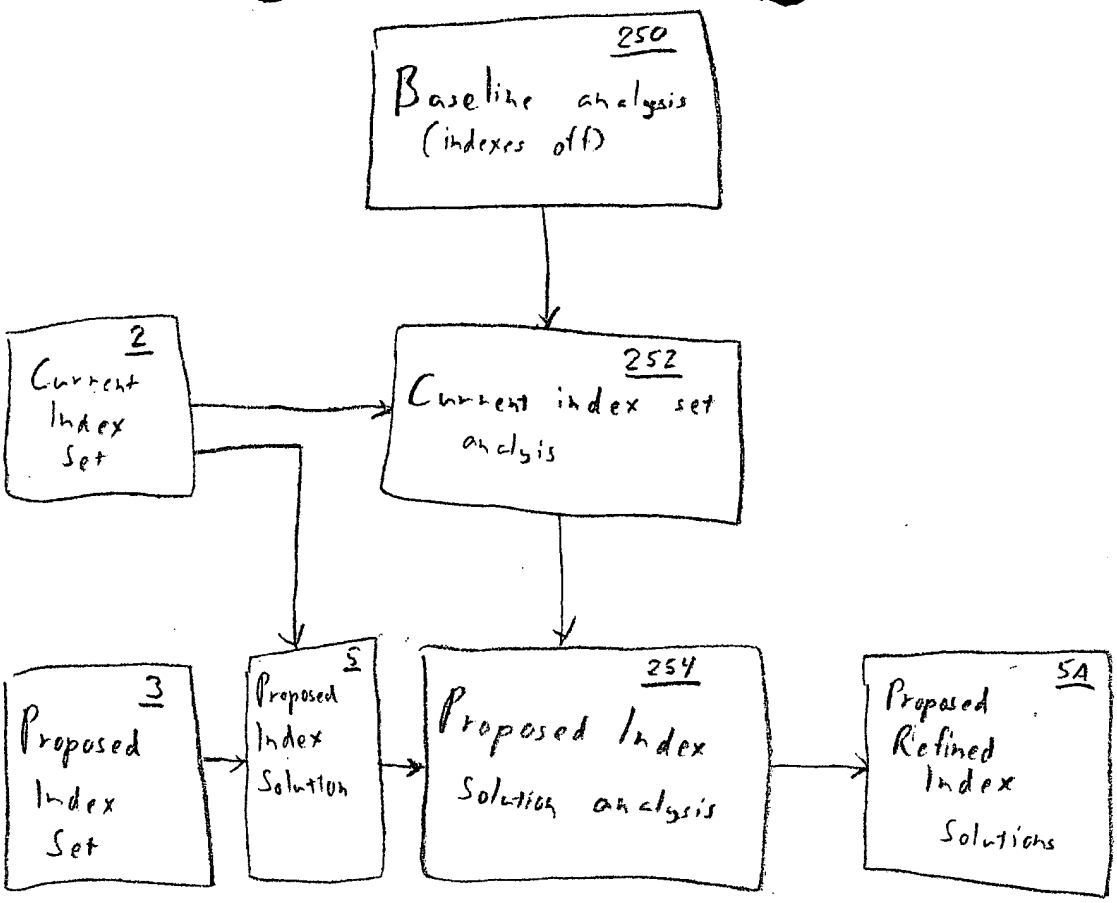

Fig. 2

09/760,260

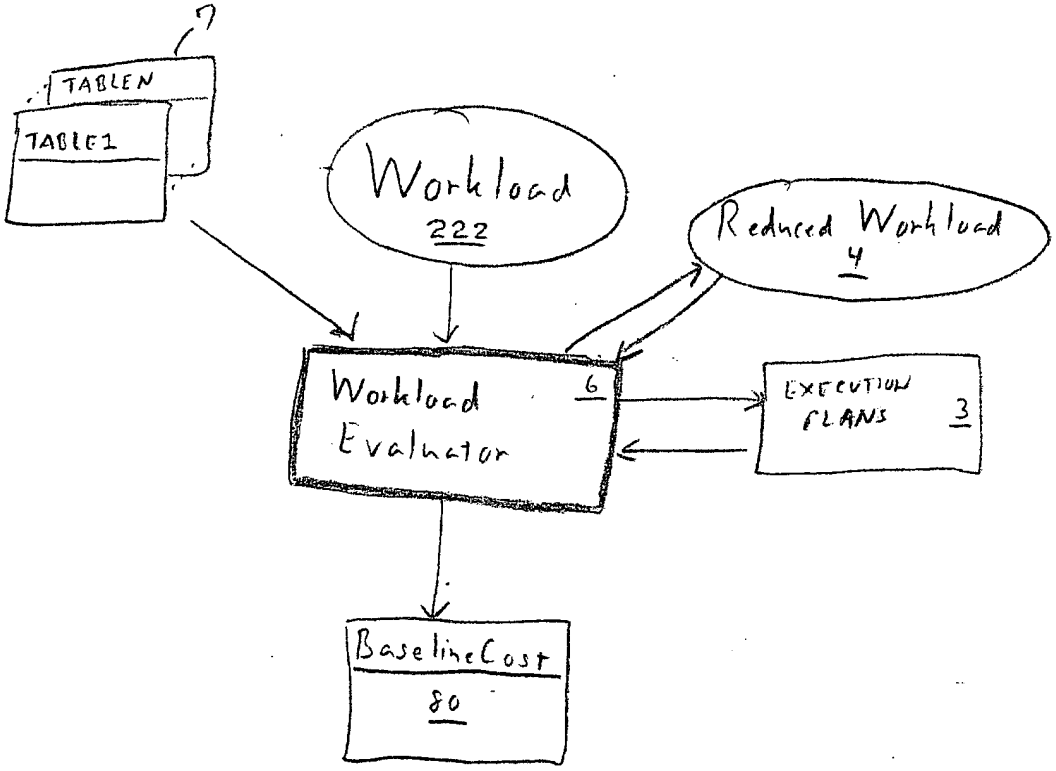

Fig. 3A

DOCKET: 6056/69

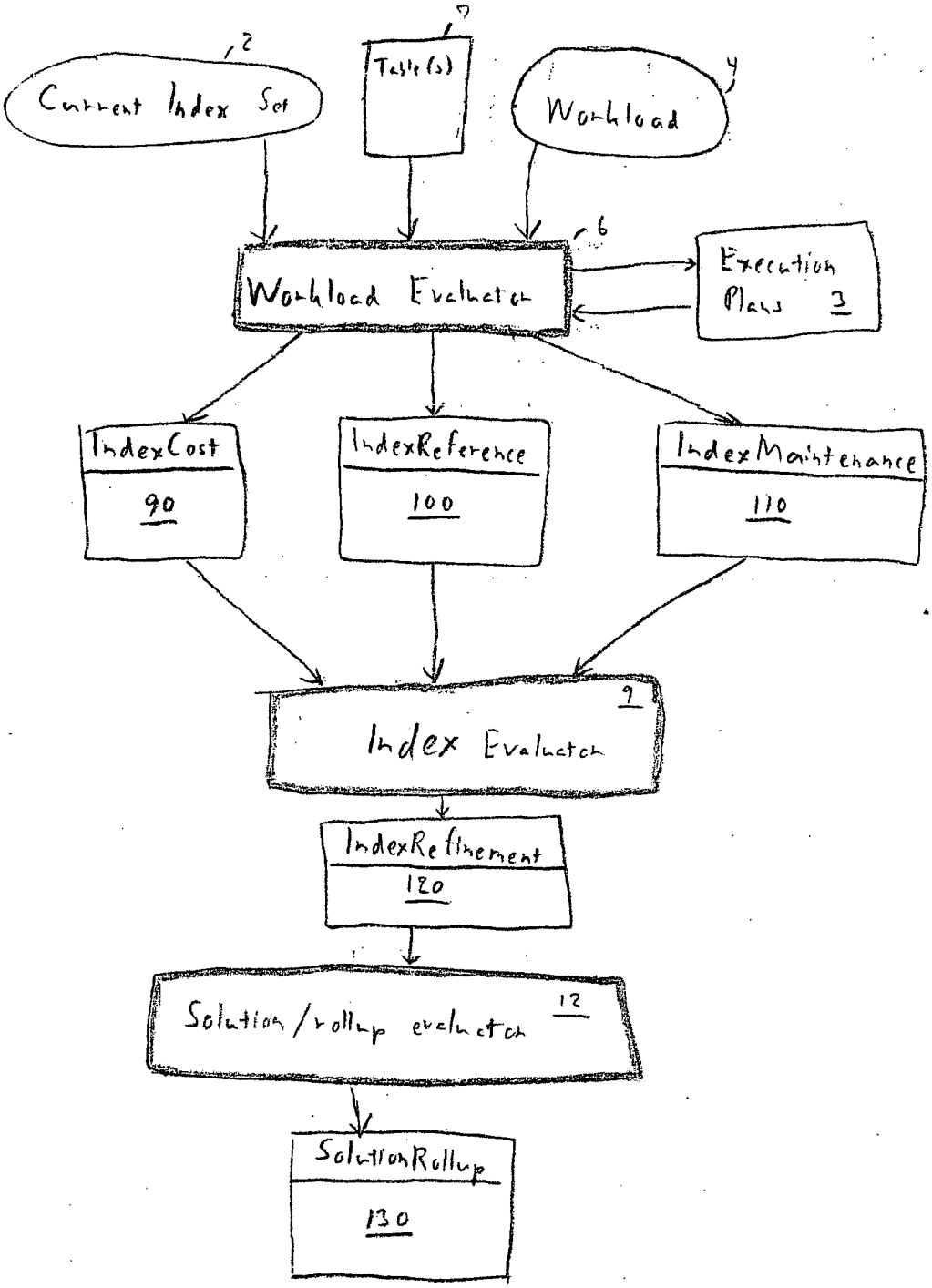

Fig. 3B

DOCKET: 6056.060

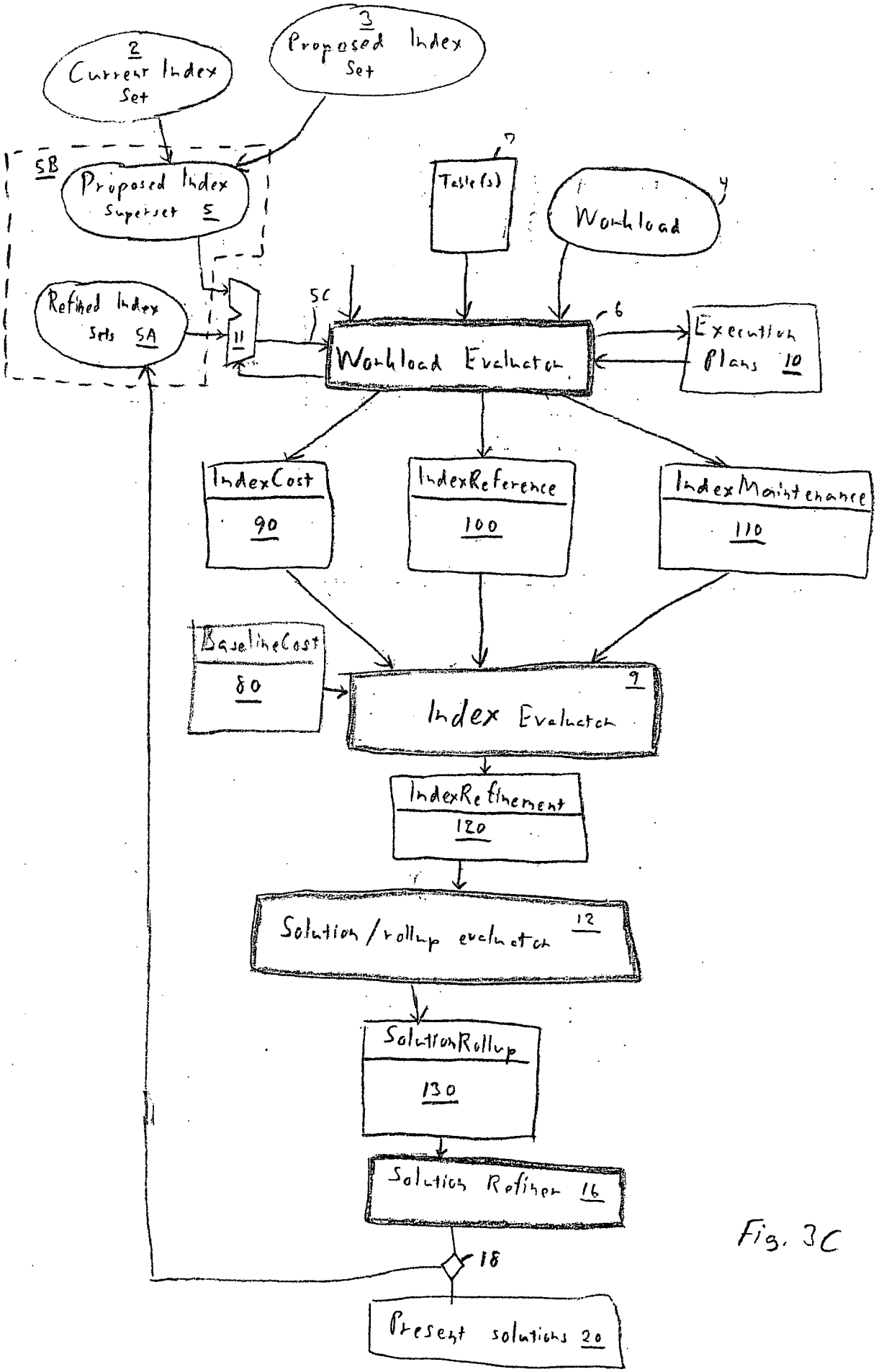

Fig. 3C

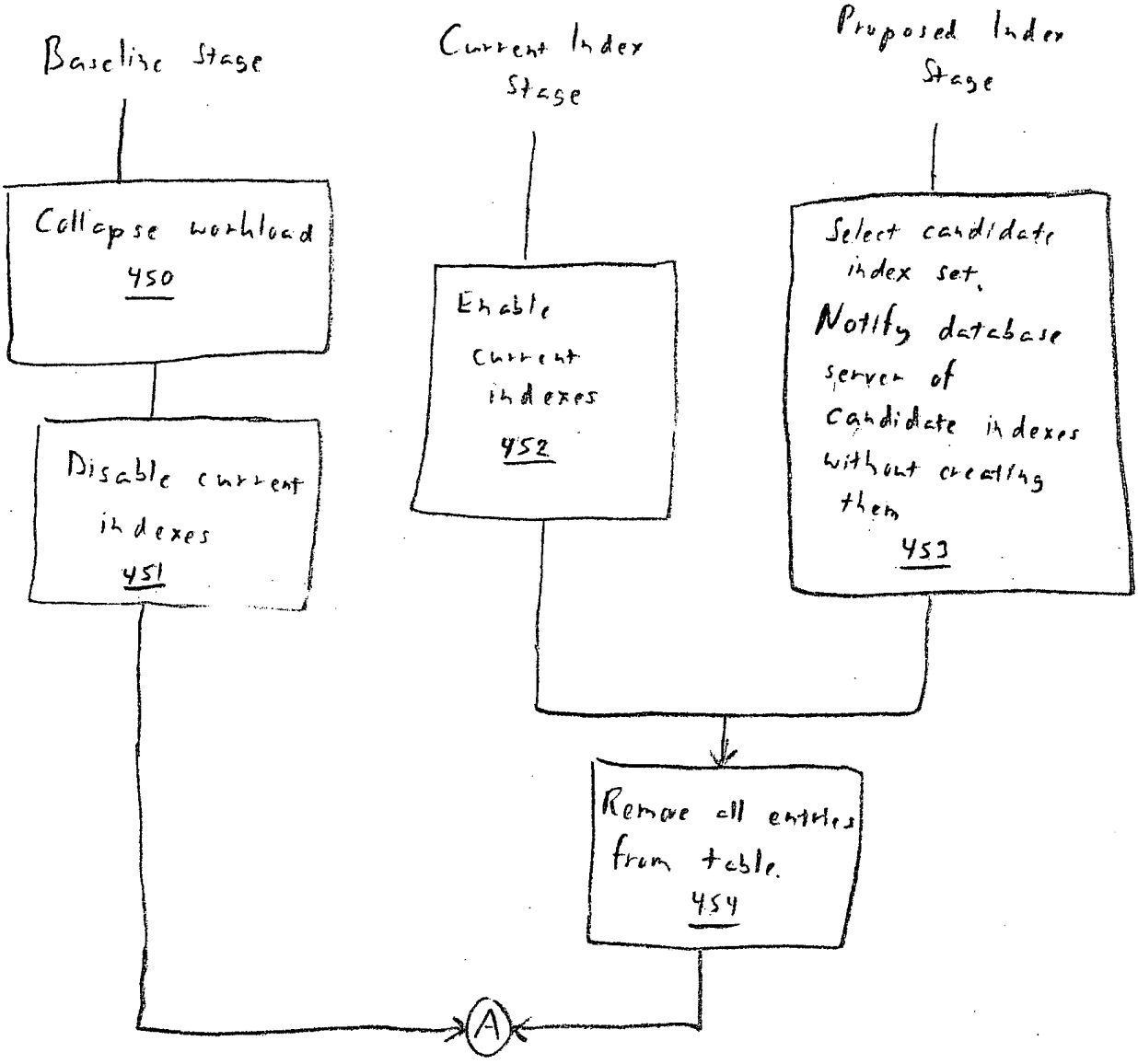
Baseline Stage
Current Index Stage
Proposed Index Stage
Collapse workload 450
Disable current indexes 451
Enable current indexes 452
Select candidate index set. Notify database server of candidate indexes without creating them 453
Remove all entries from table. 454
A

Fig. 4A

DOCKET: 50605.0

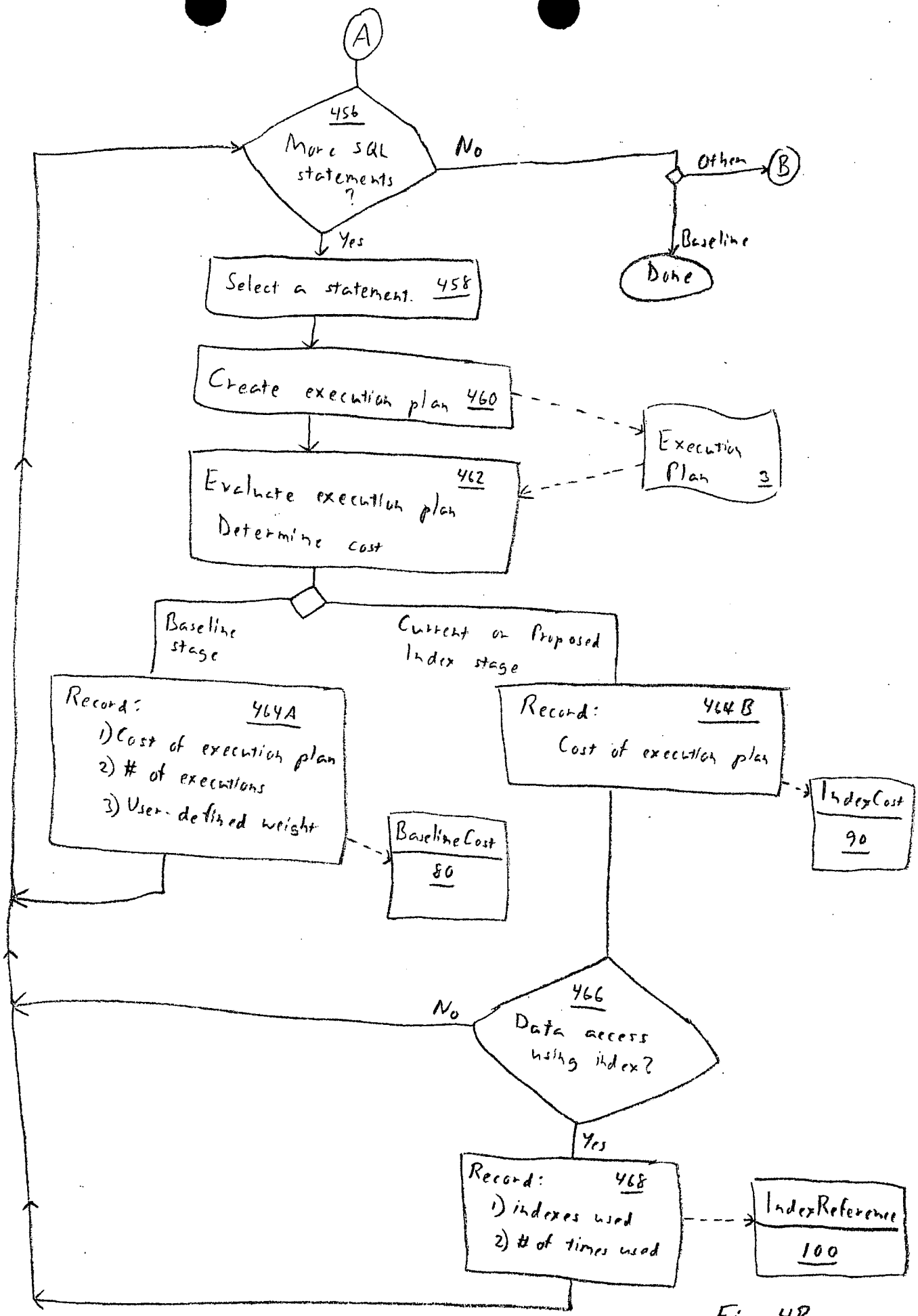

Fig. 4B

DOCKET: 6056/60

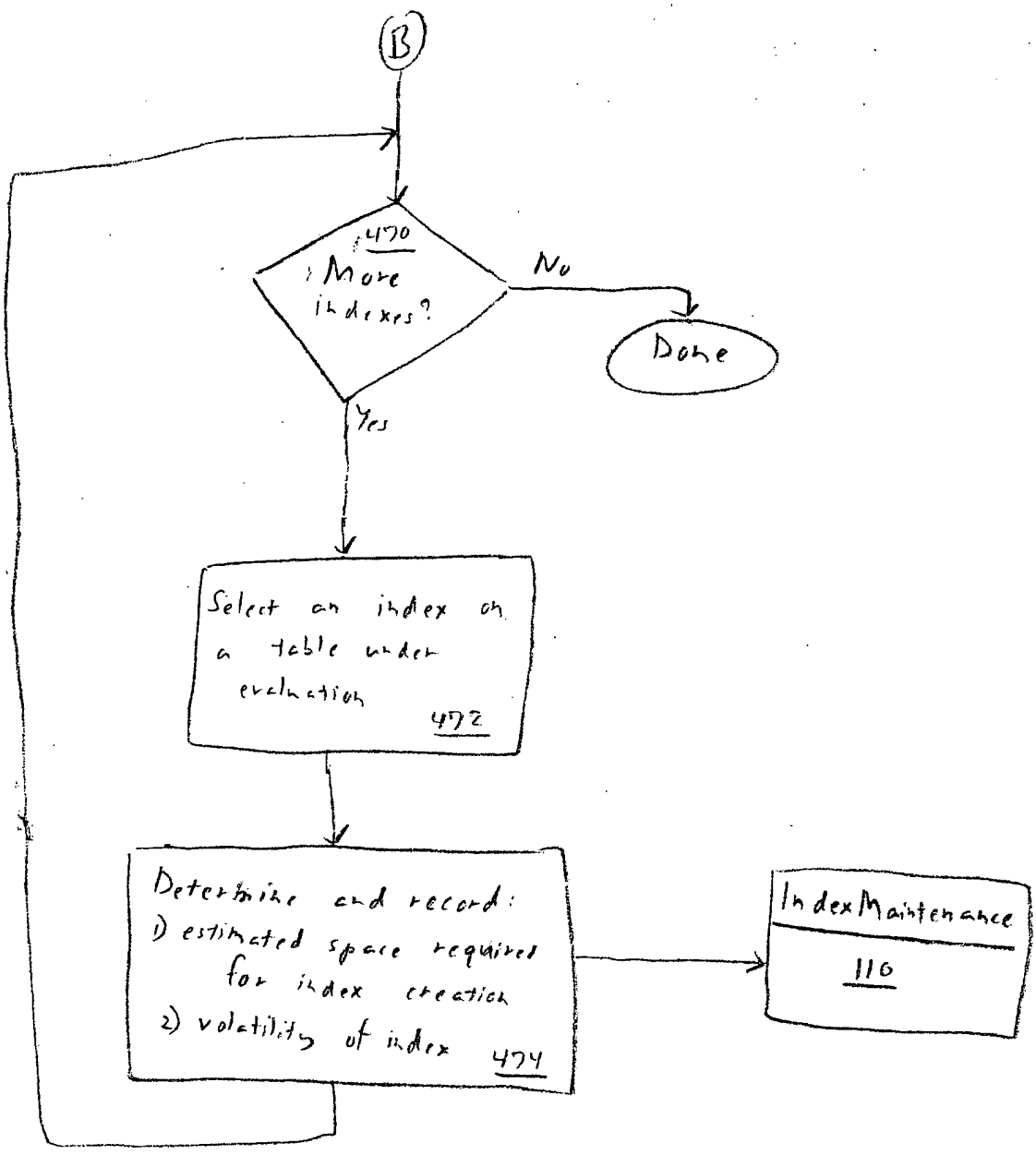

Fig. 4C

BaselineCost Table 80

StmtId 82	Cost 84	Executions 86	Weight 88	UsageCost 89

Fig. 5

IndexCost Table 90

StmtId 92	Cost 94	UsageCost 96

Fig. 6

IndexReference Table 100

StmtId 102	IndexName 104	IndexRefCount 106

Fig. 7

DOCKET: 60,950

110

IndexMaintenance Table

IndexName 112	RequiredSpace 114	Volatility 116

Fig. 8

120

IndexRefinement Table

IndexName 122	UsageValue 124

Fig. 10

DOCKET NO. 50P4074

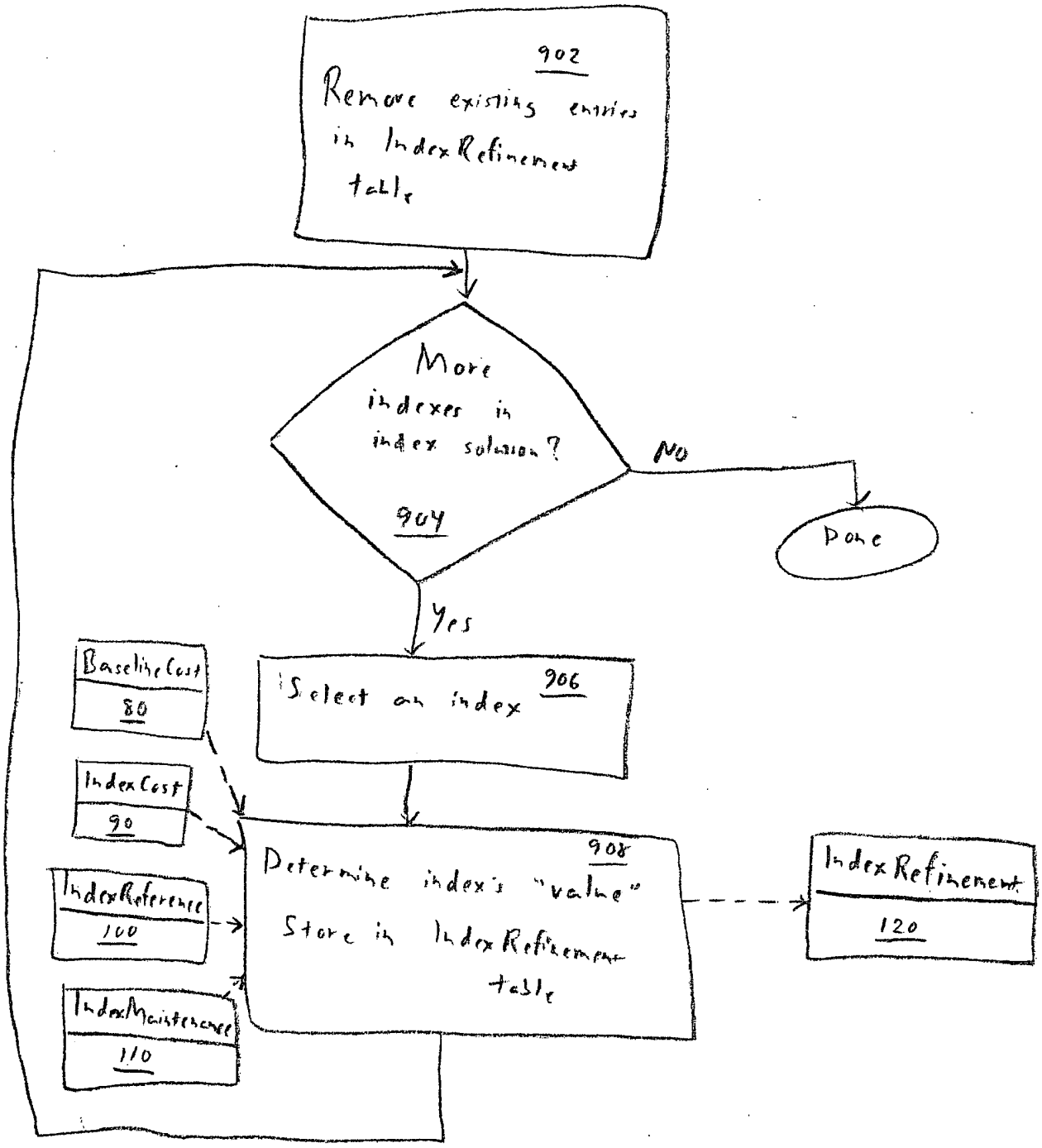
902
Remove existing entries in IndexRefinement table
More indexes in index solution?
904
No
Done
Yes
Select an index
906
BaselineCost
80
IndexCost
90
IndexReference
100
IndexMaintenance
110
Determine index's "value"
Store in IndexRefinement table
908
IndexRefinement
120

Fig. 9

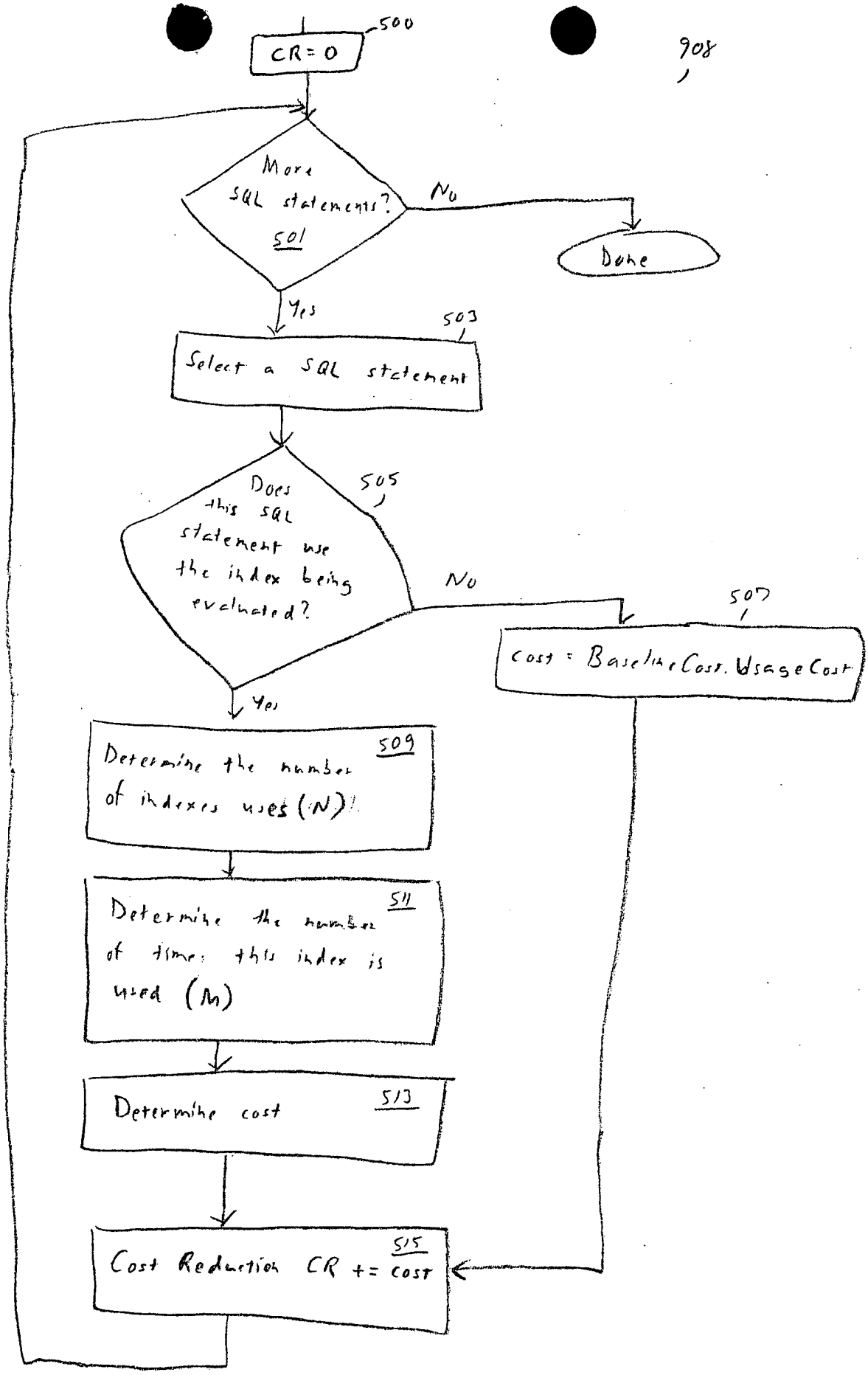
908
500
CR = 0
More SQL statements?
501
No
Done
Yes
503
Select a SQL statement
Does this SQL statement use the index being evaluated?
505
No
507
Cost = Baseline Cost. Usage Cost
Yes
509
Determine the number of indexes uses (N)
511
Determine the number of times this index is used (M)
513
Determine cost
515
Cost Reduction CR += cost

Fig. 11

130

SolutionRollupTable

SolutionId 132	Cost 134	SpaceRequired 136	Volatility 138	Efficiency 139

Fig. 12

DOCKET ALARM

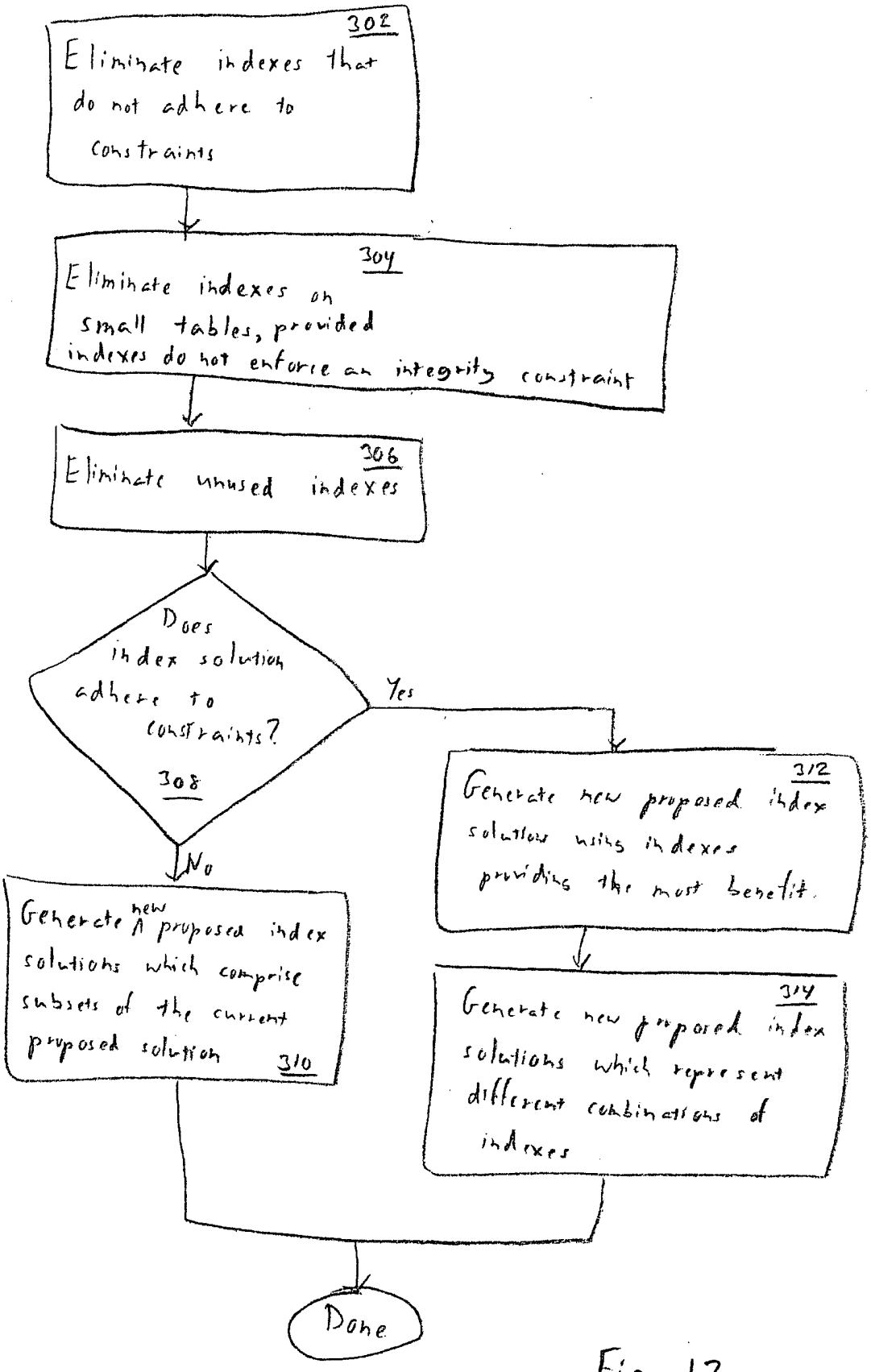

Fig. 13

DOCKET: 6036.760

DOCKET: 60560560

TABLE1 600

COL_1	COL_2	COL_3	COL_4	COL_5
601	602	603	604	605

TABLE2 610

COL_1	COL_2
611	612

TABLE3 620

COL_1	COL_2	COL_3
621	622	623

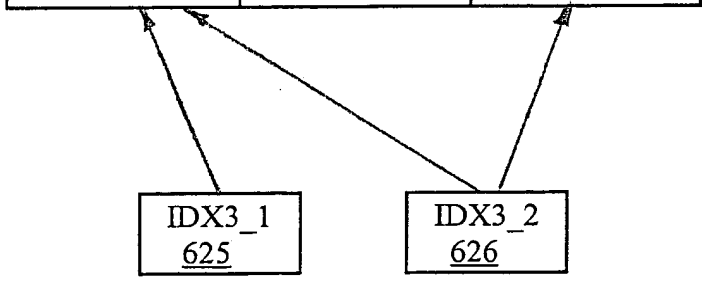

TABLE4 630

COL_1	COL_2
631	632

Fig. 14

DOCKET: 6056.0360

WORKLOAD 650

651 — /*S1*/ select COL_4 from TABLE1 where COL_2 = 1;

652 — /*S2*/ select COL_2, COL_1 from TABLE 1 where COL_2 in (1,5,10);

653 —
```
/*S3*/ select COL_1 from TABLE1 where COL_2 = 1 and COL_3 = 2
       union all
       select COL_1 from TABLE1 where COL_2 = 3 and COL_ 3 = 4
       union all
       select COL_1 from TABLE1 where COL_2 = 5;
```

654 —
```
/*S4*/ select COL_1 from TABLE1 where COL_2 = (select COL_2 from TABLE2
       where COL_1 = 10);
```

655 — /*S5*/ insert into TABLE1 values (1, 2, 3, 4, 5);

656 — /*S6*/ update TABLE2 set COL_ 1 = 10 where COL_ 1 = 20;

657 — /*S7*/ select COL_3 from TABLE3 where COL_ 1 = 1;

658 — /*S8*/ update TABLE3 set COL_3 = "Oracle Corp" where COL_ 1<30;

Fig. 15

DOCKET: 50650.569

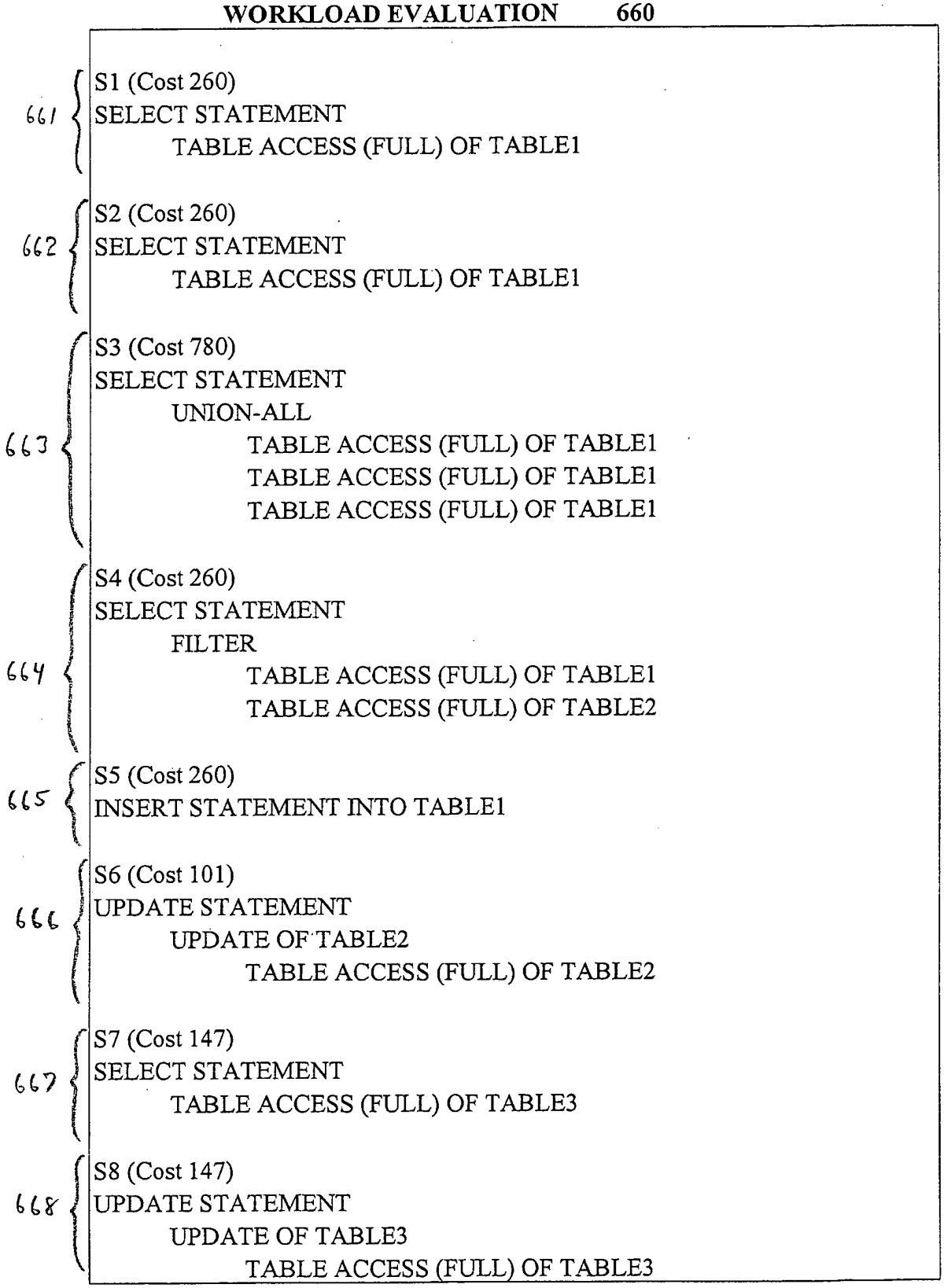

Fig. 16

BaselineCost Table 80

StmtId 82	Cost 84	Executions 86	Weight 88	UsageCost 89
S1	260	50	1.0	13000
S2	260	10	0.5	1300
S3	780	500	0.5	195000
S4	260	100	0.5	13000
S5	260	10	0.25	650
S6	101	40	0.25	1010
S7	147	500	1.0	73500
S8	147	50	1.0	7350

Fig. 17

DOCKET: 50950.350

0075074.0066360

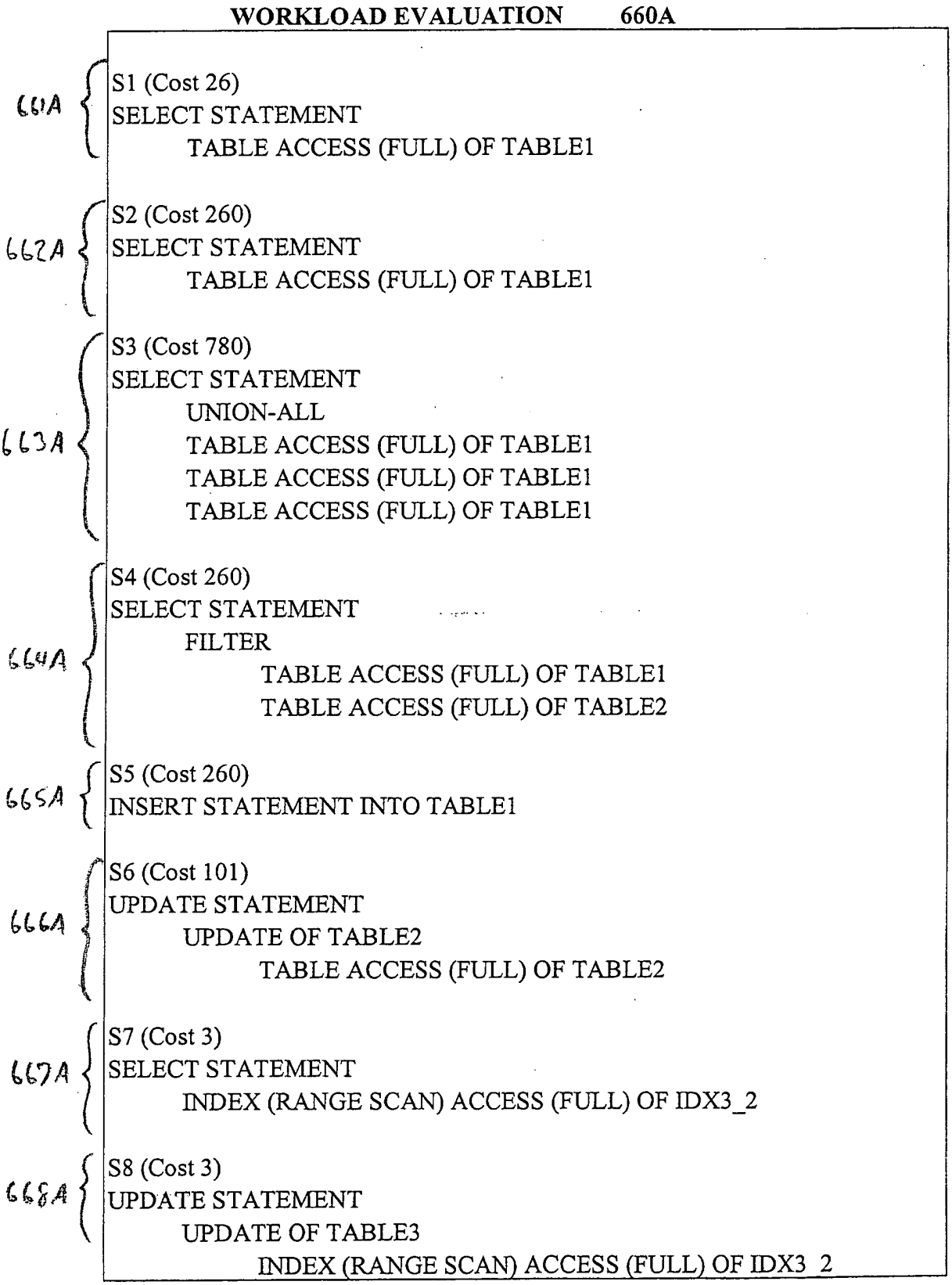

Fig. 18

IndexCost Table 90

StmtId 92	Cost 94	UsageCost 96
S1	260	13000
S2	260	1300
S3	780	195000
S4	260	13000
S5	260	650
S6	101	1010
S7	3	1500
S8	3	150

Fig. 19

IndexReference Table 100

StmtId 102	IndexName 104	IndexRefCount 106
S7	IDX3_2	1
S8	IDX3_2	1

Fig. 20

IndexMaintenance Table 110

Index Name 112	Required Space 114	Volatility 116
IDX3_1	5760	0
IDX3_2	8320	3.97

Fig. 21

IndexRefinement Table 120

IndexName 122	UsageValue 124
IDX3_1	0
IDX3_2	22.03

Fig. 22

SolutionRollup Table 130

SolutionId 132	Cost 134	RequiredSpace 136	Volatility 138	Efficiency 139
current	225610	14080	3.97	22.03

Fig. 23

DOCKET: 5065.0360

0070719.0065.260

WORKLOAD EVALUATION 660B

661B
S1 (Cost 4)
SELECT STATEMENT
TABLE ACCESS (BY INDEX ROWID) OF TABLE1
INDEX (RANGE SCAN) OF IDX1_1 (NON-UNIQUE)

662B
S2 (Cost 3)
SELECT STATEMENT
INLIST ITERATOR
INDEX (RANGE SCAN) OF IDX1_2 (NON-UNIQUE)

663B
S3 (Cost 9)
SELECT STATEMENT
UNION-ALL
INDEX (RANGE SCAN) OF IDX1_2 (NON-UNIQUE)
INDEX (RANGE SCAN) OF IDX1_2 (NON-UNIQUE)
INDEX (RANGE SCAN) OF IDX1_2 (NON-UNIQUE)

664B
S4 (Cost 3)
SELECT STATEMENT
INDEX (RANGE SCAN) OF IDX1_2 (NON-UNIQUE)
TABLE ACCESS (BY INDEX ROWID) OF TABLE2
INDEX (RANGE SCAN) OF IDX2_1 (NON-UNIQUE)

665B
S5 (Cost 260)
INSERT STATEMENT INTO TABLE1

666B
S6 (Cost 3)
UPDATE STATEMENT
UPDATE OF TABLE2
INDEX (RANGE SCAN) OF IDX2_1 (NON-UNIQUE)

667B
S7 (Cost 3)
SELECT STATEMENT
INDEX (RANGE SCAN) ACCESS (FULL) OF IDX3_2

668B
S8 (Cost 3)
UPDATE STATEMENT
UPDATE OF TABLE3
INDEX (RANGE SCAN) ACCESS (FULL) OF IDX3_2

Fig. 24

IndexCost Table 90

StmtId 92	Cost 94	UsageCost 96
S1	4	200
S2	3	15
S3	9	2250
S4	3	150
S5	260	650
S6	3	30
S7	3	1500
S8	3	150

Fig. 25

IndexReference Table 100

StmtId 102	IndexName 104	IndexRefCount 106
S1	IDX1_1	1
S2	IDX1_2	1
S3	IDX1_2	3
S4	IDX1_1	1
S4	IDX1_2	1
S6	IDX2_1	1
S7	IDX3_2	1
S8	IDX3_2	1

Fig. 26

IndexMaintenance Table 110

IndexName 112	RequiredSpace 114	Volatility 116
IDX1_1	5760	0.79
IDX1_2	9344	0.79
IDX2_1	5760	3.17
IDX2_2	5760	0
IDX3_1	5760	0
IDX3_2	8320	3.97

Fig. 27

Index Refinement Table 120

IndexName 122	UsageValue 124
IDX1_1	3.14
IDX1_2	66.91
IDX2_1	1.23
IDX2_2	0
IDX3_1	0
IDX3_2	22.03

Fig. 28

SolutionRollup Table 130

SolutionId 132	Cost 134	RequiredSpace 136	Volatility 138	Efficiency 139
current	225610	14080	3.97	22.03
Solution1	4945	40704	7.9	90.5

Fig. 29